Explosives and Hazardous Devices Examinations

1 Scope

These procedures describe the process for explosives and hazardous devices examinations and apply to caseworking personnel who examine explosives and hazardous devices such as, but not limited to, main explosive charges, explosive devices, improvised explosive devices (IEDs), associated components, and their post-blast remains to determine identifying information and functionality.

2 Introduction

These procedures are designed to provide a general overview of the goals and approaches utilized by explosives and hazardous devices personnel in the forensic examination of evidence. The basic procedures described herein are geared towards the examination of IEDs, however, the principles are the same for the examination of other types of hazardous devices, such as, but not limited to, military explosive devices and their components, incendiary devices, and hoax devices. Specifics related to the examination of individual items often found in bombing evidence are contained in separate procedures .

3 Equipment/Materials/Reagents

Refer to specific component examination procedures for a list of items that can be used by personnel for the forensic examination of evidence. Explosives and hazardous devices personnel should choose the most appropriate items based on the nature of the evidence.

4 Standards and Controls

Not applicable.

5 Sampling or Sample Selection

Not applicable.

6 Procedures

The primary objective of explosives and hazardous devices personnel is to determine the physical construction and functioning characteristics of IEDs, or portions thereof, submitted as

evidence, with the goal of ascertaining whether the device or components possess the functional characteristics and/or design elements of a weapon and therefore meets the technical elements of a destructive device.[1] The methodology for the forensic examination of explosives and hazardous devices can be broken down into six (6) steps:

Step 1 – Segregation
Step 2 – Recognition
Step 3 – Identification
Step 4 – Function Determination
Step 5 – Comparison
Step 6 – Destructive Device Determination

It is important to note that the pressures (millions of psi) and temperatures (thousands of degrees Kelvin) potentially generated in an explosive reaction impose an inherent limitation to this examination methodology; some of the items can be so severely damaged that it may be impossible to complete every step of the process. These steps are listed only as an outline of the process used by personnel while examining evidence. The steps may be conducted in parallel or in any logical sequence depending on the nature of the evidence.

6.1 Segregation

Since IEDs can be constructed from various items, the first step in the examination process is the segregation of relevant items present in the evidence. Often items submitted as evidence were not part of the device, consisting instead of background debris from the scene of the explosion. Proper segregation of relevant evidence often requires communication with those who were on scene and is accomplished in part with the application of step two (2).

As part of the segregation process explosives and hazardous devices personnel will separate out items of forensic value for further examinations, and with the aid of personnel from other Laboratory units, select items to go to other forensic disciplines for examination. All items deemed forensically relevant will be photographed following the Evidence Photography procedure.

6.2 Recognition

All IEDs require an explosive and a mechanism that causes this material to explode. The explosive is referred to as the main charge and the mechanism causing the main charge to explode is referred to as the initiating, or fuzing, system. The purpose of a fuzing system is to supply energy to function the main charge. Fuzing systems are further categorized as being either non-electric or electric. For example, anything that can undergo combustion or create sufficient thermal output to induce chemical decomposition in a heat-sensitive energetic material can potentially serve as a non-electric fuzing system. Electric fuzing systems tend to be more

[1] 26 U.S.C. § 5845(f) and 18 U.S.C. § 921(a)(4)

complex, usually requiring multiple electrical components such as, but not limited to, batteries, wire, and switches.

Based on these general principles, submitted items will be visually and/or microscopically examined to find those which could potentially function as components of an IED.

Based on the visual and/or microscopical examination, explosives and hazardous devices personnel will attempt to assign general attributes, or class characteristics, to items of evidence that could potentially function as part of the IED (e.g., determining that a particular item is a portion of a battery skin). If possible, all items assigned general attributes will be taken to section 6.3.

6.3 Identification

The process of component identification requires the visual and/or microscopical analysis of a constellation of physical characteristics such as, but not limited to, material type, shape, and color. Other physical characteristics can be examined through measurements, including, but not limited to, sizes, angles, and voltages. These measurements are not traceable, but are used to determine the dimensional value of technical parameters that may be relevant to affecting the identification of a particular component and determining its possible commercial manufacturing source. As the physical measurements outlined in device-related procedures are not traceable, they are not subject to detailed error analysis to determine measurement uncertainties.

Each component determined to be part of the IED will be attributed to a potential source, as appropriate. Information such as the potential component manufacturer, brand, and type will be determined, as appropriate. If required, a *conclusive* determination as to the identification of an item will be made only if the source of the item is corroborated through direct communications with the distributor or manufacturer of the item. Specifics about a component, such as, but not limited to, availability and common uses, that might aid investigators should be sought out, as appropriate.

6.4 Function Determination

After the item identification process is completed, explosives and hazardous devices personnel will attempt to determine the role of identified items in the functioning of the IED. It is emphasized again for this step that the destruction created by the forces from the explosion of an IED may render a definitive determination of how it functioned impossible. Explosives and hazardous devices personnel must use their expertise to opine on the role of the components in the functioning of the IED, as well as how the overall IED might have been constructed and functioned. Circumstances of the incident surrounding the recovery of the IED, or its components, may be taken into account when making this determination. Caution must be taken not to overstep the bounds of what can be logically inferred from the examinations and facts of the case.

6.5 Comparison

There are two (2) general types of comparison examinations that occur in explosives and hazardous devices examinations: IED/known origin comparisons (between the components of an IED and items of known origin) and inter-device comparisons (comparison examinations between the components of multiple IEDs). In both examinations, visual and/or microscopical comparisons will be made between the physical characteristics of various items to determine if there are discernable differences with respect to those characteristics. These types of examinations involve the comparison of observable characteristics, such as, but not limited to, component shapes, colors, and markings. The examinations may also involve comparison of measured, physical characteristics, such as, but not limited to, sizes, angles, and voltages.

6.5.1 Inter-Device Comparison

Visual and/or microscopical and/or measurement comparisons are conducted between components (and their respective functioning) of multiple IEDs. Examinations are applied towards, but not limited to, serial bombing investigations where the purpose is to determine if otherwise unrelated IEDs share common componentry, designs or construction methods.

6.5.2 IED/Known Origin Comparison

Visual and/or microscopical and/or measurement comparisons are conducted between the components of an IED and items of known origin, such as, but not limited to, the recovered constituents of an exploded IED and components recovered from the search of a suspect's residence.

6.6 Destructive Device Determination

An "explosive device" or "IED" describes what in lay terms would commonly be called a "bomb" or "homemade bomb." In legal terms, however, "explosive device" and "IED" have specific meanings and could include things such as commercial and improvised fireworks. The legal term for what most statutes would call a bomb or "IED" is "destructive device."[2] A destructive device is an "explosive device" or "IED" designed to serve as a weapon. As "designed" infers an element of intent, the jury is the final arbiter as to whether an intact device or device components constitute the legal definition of a destructive device.[3] Furthermore, the courts have utilized various approaches regarding interpretation of the destructive device statutes.[3-7] The explosives and hazardous devices examiner assists the jury by offering an

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[2] Department of Justice's Executive Office for United States Attorneys. Forensic Science Primer: Explosives. (Retrieved from DOJNET at https://dojnet.doj.gov/usao/eousa/ole/tables/subject/bomb.htm#stat

[3] 26 U.S.C. § 5845(f) and 18 U.S.C. § 921(a)(4)

[3] *United States v. Hammond,* 371 F.3d 776 (11th Cir. 2004): provides an example of the Subjective Standard used by courts in destructive device determinations

[5] *United States v. Johnson,* 152 F.3d 618 (7th Cir. 1998): provides an example of the Mixed Standard used by courts in destructive device determinations

opinion as to whether the device or device components possess the functional characteristics and/or design elements of a weapon. After the above steps are completed, a determination is made as to whether the IED possesses the attributes of a weapon and therefore meets the two technical elements of a destructive device. These two elements are purely technical, not legal, and are not meant to infer the intent of the individual(s) who constructed the device. The physical examination of an explosive or hazardous device or its components taken outside the context of utilization may not allow the determination of a destructive device to be made due to the absence of characteristic weapon design elements. In said absence, the manner in which the explosive or hazardous device was utilized is taken into consideration to determine its capability to function as a weapon.

7 Calculations

Not applicable.

8 Measurement Uncertainty

Not applicable.

9 Limitations

The following are general limitations of the explosives and hazardous devices examination process described herein:

Conclusive identifications of the source of an item may not be realized in every case due to the absence or alterations of specific manufacturer or other unique markings on items of evidence.

The physical characteristics, such as, but not limited to, material type, shape, and color of all evidentiary items described in this report are based on visual and/or microscopical observations, unless otherwise noted. Other parameters such as, but not limited to, distances, angles, and voltages associated with individual evidentiary items are based on physical measurements and are approximate, unless otherwise noted. Should a more complete characterization of these items be required, additional examinations can be requested of the appropriate forensic discipline. Diagrams such as, but not limited to, drawings and schematics are not to scale, unless otherwise noted.

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[6] *United States v. Oba,* 448 F.2d 892 (9th Cir. 1971): provides an example of the Subjective Standard used by courts in destructive device determinations

[7] *United States v. Psonjak,* 457 F.2d 1110 (2nd Cir. 1972): provides an example of the Objective Standard used by courts in destructive device determinations

The explosion and or fire resulting from the functioning of an improvised explosive or incendiary device can cause extensive damage, such as fragmentation, charring or other severe alterations to items of evidence. Due to the destructive nature of these types of energetic events, conclusive determinations as to the recognition and identification of specific device components, as well as the exact design and functioning of the device, may not always be realized in every case.

The two elements that must be met to make an affirmative destructive device determination are that the device or device components constitute an explosive or incendiary device and that the device or device components possess the functional characteristics and/or design elements of a weapon. These two elements are purely technical, not legal, and are not meant to infer the intent of the individual(s) who constructed the device.

In the absence of characteristic weapon design elements, physical examination of an explosive or hazardous device or its components taken outside the context of utilization may not allow the determination of a destructive device to be made. In said absence, an examiner may have to consider the circumstances in which the explosive or hazardous device was utilized to determine its capability to function as a weapon; this consideration is not meant to infer the intent of the individual(s) who constructed the device.

Explosives and hazardous devices personnel must determine which examinations are appropriate based on what items have been deemed of forensic value. Further guidance is provided in the TP titled Explosives and Hazardous Devices Report Writing Guidelines.

10 Safety

Safety protocols are contained within the FBI Laboratory Safety Manual as well as specific TPs and will be observed at all times.

11 References

FBI Laboratory Division

FBI Laboratory Quality Assurance Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

FBI Laboratory Operations Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

FBI Laboratory Safety Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

Explosive Devices Technical Procedures, Federal Bureau of Investigation, Laboratory Division, latest revisions.

Other

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Rev. #	Issue Date	History
2	07/17/2018	Updated SOP title to reflect the full title of the forensic specialty. Administrative changes to Sections 1, 2, 6, 6.1 – 6.5, 6.51, 6.52 for grammar and clarity. Updated Section 6 to include the goal of the explosives and hazardous devices examiner in ascertaining whether the device being examined meets the technical elements of a destructive device. Updated Sections 6.2 – 6.3, 6.5, 6.5.1, 6.5.2 to clarify that items are visually and/or microscopically examined. Updated Section 9 for clarity and to further elucidate the general limitations associated with the explosives and hazardous devices examination process described herein.
3	07/15/2021	Administrative changes to Sections 1 – 3, 6, 9 – 10 for grammar and clarity. Included Section 6.6 to describe the step of destructive device determination. Reformatted Section 11 and updated it with more references.

Approval

Redact - Signatures on File

Explosives and Hazardous Devices Technical Leader Date: 07/15/2021

Explosives Unit Chief: Date: 07/15/2021